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Relaxation-Induced Anxiety: Paradoxical Anxiety Enhancement Due to Relaxation Training

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The present study was designed to document the occurrence of relaxation-induced anxiety. Fourteen subjects (7 male, 7 female) suffering from general tension were given one session of training in each of two relaxation methods, progressive relaxation and mantra meditation; order of presentation was counterbalanced. Four of the subjects plus one other who terminated prematurely displayed clinical evidence of an anxiety reaction during a preliminary practice period, while 30.8% of the total group under progressive relaxation and 53.8% under focused relaxation reported increased tension due to the relaxation session. Progressive relaxation produced greater reductions in subjective and physiological outcome measures and less evidence of relaxation-induced anxiety.

Only recently has evidence begun to suggest the possibility that a subset of anxious clients may display paradoxical increases in cognitive, physiological, or behavioral components of anxiety as a consequence of engaging in systematic relaxation training. This phenomenon, referred to here as relaxation-induced anxiety, has been mentioned in anecdotal reports on techniques ranging from meditation (French, Schmid, & Ingalls, 1975; Kennedy, 1976; Lazarus, 1976) to progressive relaxation (Borkovec & Grayson, 1980) and biofeedback (Miller & Dworkin, 1977). In addition, apparent relaxation-induced anxiety has been noted in passing in experimental investigations assessing the efficacy of relaxation techniques in treating generalized tension and anxiety (e.g., Borkovec & Hennings, 1978; Raskin, Johnson, & Rondesvedt, 1973). As yet, however, no systematic evaluation of the phenomenon has been reported in humans, although evidence suggests that relaxation can be established as a conditioned stimulus for anxiety in animals (Denny, 1976).

The present study's major purpose was to assess the degree to which relaxation-induced anxiety could be observed during an initial relaxation session. A subject sample suffering from generalized tension was used, since most previous reports of the phenomenon have occurred with similar groups (e.g., Carrington, 1977; Raskin et al., 1973).

The second purpose of the study was to examine differential occurrence of relaxation-induced anxiety with different techniques. In a within-subjects crossover design, all subjects received two commonly employed relaxation techniques, progressive relaxation and mantra meditation, in counterbalanced order. Both techniques have been found to produce significant reductions in subjective and physiological arousal in previous research (e.g., Borkovec & Sides, 1979; Woolfolk, 1975). However, as argued by Davidson and Schwartz (1976), progressive relaxation involves active self-generation of, and passive attention to, somatic processes, whereas meditation employs active and passive cognitive procedures. It was felt that the use of two different procedures, differentially emphasizing somatic and cognitive events, might aid in directing future efforts to identify mechanisms responsible for relaxation-induced anxiety.

In order to elucidate possible mechanisms underlying the phenomenon, the study's third

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purpose was to identify correlates of its occurrence. Previous clinical and theoretical speculations suggest the following five related but distinguishable mechanisms (Heide, 1981): (a) arousal due to the novelty of the sensory or cognitive-affective side effects generated by the process of "unstressing" or "stress-release" (Budzynski, Stoyva, & Peffer, 1980; Carrington, 1977; Goleman, 1971); (b) arousal due to overuse of effort (Peper, 1976) or fear of loss of control (Bernstein & Borkovec, 1973; Carrington, 1977); (c) arousal among anxiety phobics (Ascher, 1980) due to fear of the experience of their own daily tension, to which their attention is drawn during relaxation; (d) inward attending or self-confrontation that may be frightening to some individuals, especially those high in self-dissatisfaction (Sackheim & Gur, 1978); (e) creation of conditions maximizing worrisome activity about events unrelated to relaxation (Bernstein & Borkovec, 1973). Outcome measures in the present study were correlated with specific self-report measures designed to examine each of these preceding mechanisms.

Method

Subjects

Subjects were recruited through advertisements and articles in local newspapers offering free brief training in relaxation. On the basis of a telephone interview with the first author, 15 subjects were selected who met the following criteria: (a) experience of self-reported tension, anxiety, or nervousness during at least 40% of the day and (b) rating of this tension as moderate to severe on a 5-point scale (very mild to severely tense). Similar criteria have been used in previous studies of generalized tension (e.g., Borkovec, Grayson, & Cooper, 1978). Duration of tension ranged from 6 months to 8 years, with 4 subjects reporting that they had "always" been this tense. One subject failed to complete the second session (see below), leaving a total of 14 subjects (7 male, 7 female) with a mean age of 34.4 (SD = 13.7). Occupational backgrounds included student (4), housewife (3), retiree (2), teacher (1), file clerk (1), university professor (1), salesman (1), and media specialist (1). All subjects agreed to abstain from nonessential drugs for at least 2 days prior to the study; 5 subjects reported use of prescription drugs for psychosomatic disorders, only one of whom (Subject no. 8) was taking an anti-anxiety agent. No attempt was made to select subjects on the basis of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III; APA, 1980); however, on the Trait Anxiety scale of the Cognitive-Somatic Anxiety Questionnaire, all but one subject reported moderate to severe experience of symptoms from three of the four categories (motor tension, autonomic hyperactivity, apprehensive expectation, and vigilance and scanning) used in the DSM-III diagnosis of generalized anxiety disorder. Subjects received a mean score of 42.6 (SD = 9.1) on the Trait scale of the State-Trait Anxiety Inventory, which failed to differ significantly from mean scores for a normative sample of psychiatric patients hospitalized for anxiety reaction (M = 48.1; SD = 10.6; Spielberger, Gorsuch, & Lushene, 1970).

Experimenters

Each session was conducted by the first author and one of four female research assistants uninformed about the purposes of the study. The first author described and demonstrated treatments to subjects, attached electrodes to male subjects, operated the polygraph, and debriefed the subjects. Research assistants administered questionnaires and consent forms, attached electrodes to female subjects, and obtained verbal ratings of tension during sessions. The same assistant was present at both sessions for a given subject.

Physiological Apparatus

All recordings were made using a Beckman Type R611 Recorder. For skin conductance, standard-size Beckman Ag/AgCl electrodes filled with 0.5-M NaCl solution (Edelberg, 1967) were attached to alcohol-cleansed skin at the thenar eminence and hypothenar eminence of the left palm and connected to a Beckman Type 9844 Skin Conductance coupler. A reflected-light photocell plethysmograph monitored heart rate from the volar surface of the distal phalanx of the third finger of the left hand, using a Beckman Type 9853 Voltage/Pulse/Pressure coupler. For frontalis electromyogram (EMG), two miniature Beckman Ag/AgCl electrodes filled with Biocom Biogel were placed on abraded and alcohol-cleansed skin over the left frontalis muscle. A Beckman Type 9852 EMG coupler was used to obtain the average EMG signal; output from this coupler was fed through a Beckman Type 9878 Integrating coupler to obtain an integrated signal. Respiration was measured with a mercury-filled silastic strain gauge placed around the abdomen below the sternum and connected to a Beckman Type 9875 coupler.

Procedure

Subjects were seen individually for two sessions at the same time of day on two consecutive days. All subjects received both treatments, in counterbalanced order across subjects. During the first session, subjects were informed by tape that the program was designed to assess which relaxation procedures were effective or ineffective for different people. After being instructed to respond as honestly as possible to all questionnaires, subjects completed pretreatment questionnaires and were taken to a pleasantly decorated room equipped with reclining chair and intercom. Physiological recording equipment was located in an adjacent room. Prior to beginning the session, subjects about to receive progressive relaxation briefly practiced tensing and releasing relevant muscle groups, whereas subjects in focused relaxation closed their eyes and repeated the focusing device for 45 sec. Physiological recording devices were then attached, and the subject was left alone in the therapy room for the remainder of the session. Following a 15-min eyes-open adaptation period, subjects heard tape-recorded instructions describing and initiating the technique to be practiced in that day's session.

Progressive relaxation. Subjects received standardized, taped instructions, as described by Bernstein and Borkovec (1973), asking them to sequentially focus attention on, tense (for 5–7 sec), and release muscles in 14 muscle groups (feet excluded) throughout the body while the tape provided indirect suggestions of relaxation and calm for 30 to 45 sec between tension-release cycles. Subjects performed two cycles on each muscle group before proceeding to the next group. The ordinary use of subject control over training progress was eliminated in order to maximize the likelihood of relaxation-induced anxiety and to standardize the amount of training time spent in each relaxation procedure.

Focused relaxation. The taped instructions described a form of meditation similar to the Transcendental Meditation technique. To minimize expectancy effects, no mention of the word *meditation* was made. Subjects were instructed to gently focus their attention in a passive, effortless manner on a meaningless focusing device ("Ahnam") to be repeated subvocally.

Following relaxation, subjects completed posttreatment questionnaires. Procedures for the second session were identical to the first with three exceptions: No personality measures were administered; the alternate relaxation technique was demonstrated and employed; and a final questionnaire was administered at the end of the session just prior to debriefing.

Measures

Subjective outcome measures. State anxiety before and after each relaxation period was assessed by the Anxiety Differential (Husek & Alexander, 1963) and a specially developed state version of the Cognitive-Somatic Anxiety Questionnaire (CSAQ-State; Schwartz, Davidson, & Goleman, 1978) containing cognitive and somatic subscales. At three points during the session (beginning of adaptation, end of adaptation, end of treatment), subjects were asked to separately rate how tense their body and mind were at that moment on a 1 to 10 scale (1 = total relaxation; 10 = extreme tension).

Physiological outcome measures. Five physiological measures were employed: tonic and phasic skin conductance, heart rate, respiration rate, and frontalis EMG. Samples were taken at the following points during the progressive-relaxation condition: (a) 1-min periods during the 5th, 10th, and last minute of the 15-min pretreatment adaptation period; (b) 20-sec periods during the second relaxation cycle of the left biceps, neck, and right calf (corresponding to the following times: 5-min, 55-sec into treatment; 12-min, 20-sec into treatment; 19-min into treatment); and (c) posttreatment, the last minute of the 2-min quiet period after training was completed. Samples taken during focused relaxation corresponded to the same temporal periods employed for progressive relaxation. During the posttreatment sample, subjects in both conditions were instructed to simply enjoy the feelings of relaxation.

Personality measures. To identify correlates of outcome and to examine the five proposed mechanisms for relaxation-induced anxiety, all subjects were administered a battery of self-report measures at the beginning of the first session. A specially constructed Reactions to Relaxation and Arousal Questionnaire (RRAQ) contained 28 items hypothesized to be related to the phenomenon.[1] The scale was factor analyzed with varimax rotation on data from 252 introductory psychology students, and four composite factor scores were then created for the 14 subjects in the present study by multiplying subjects' normalized scores on the 28 items times the factor score coefficients for the first four factors in the original factor analysis. Factors 1 and 2 represented fear of losing control when anxious and fear of negative social consequences when anxious, respectively, and were used to examine the hypothesis that relaxation-induced anxiety would be greater in those who fear the experience of their own daily tension (Mechanism c). Factor 3 represented general restlessness and fear of inactivity. Factor 4 (fear of "letting go") was one of several measures used to explore whether relaxation-induced anxiety was related to general fears of loss of control (Mechanism b). Trait anxiety was measured by the Trait Anxiety scale of the Spielberger State-Trait Anxiety Inventory (Spielberger et al., 1970) and the Cognitive-Somatic Anxiety Questionnaire (CSAQ-Trait) containing both cognitive and somatic subscales.

Other personality measures thought to possibly relate to relaxation included Rotter's (1966) Locus of Control scale and Tellegen and Atkinson's (1974) Absorption scale. Intermixed with the 34 items of the latter scale were items from two other specially developed scales: (a) the Effort/Control scale, consisting of 5 items assessing belief in the efficacy of active, effortful strategies and fear of situations involving loss of control (Mechanism b), and (b) a 6-item Cognitive Discrepancy scale designed to measure dissatisfaction with the self. The latter scale, which included three items from the Eysenck Personality Inventory (Eysenck & Eysenck, 1963), investigated the hypothesis that relaxation-induced anxiety is related to fear of confronting aspects of the self that subjects dislike (Mechanism d).

Posttreatment subjective measures. After each session, subjects completed a postrelaxation questionnaire designed to explore whether relaxation-induced anxiety was related to intense experience of stress-release side-effects (Mechanism a). It listed a series of stress-release effects reported to occur during relaxation (cf. Carrington, 1977): 10 sensory-alteration items (e.g., floating, heaviness) and 8 cognitive-affective items (e.g., disturbing thoughts or images). Subjects rated how intensely they experienced each item on a 7-point scale. Each subject was also given an overall averaged intensity index for each of the two categories. A second questionnaire assessed experiential state during relaxation, including irrelevant worrisome thoughts (Mechanism e). Lastly, a final questionnaire was administered at the end of the experiment, asking the subjects simply to indicate whether they became more tense at any time as a result of each relaxation session.

[1] The RRAQ is available on request.

Results

Quantification of Physiological Data

All measures were scored blind with respect to experimental condition. Tonic skin-conductance level was determined by measuring the lowest value occurring within the recording period. Due to their low frequency, spontaneous skin conductance responses (phasic skin conductance) were sampled only during the 1-min adaptation and posttreatment periods. A spontaneous response was defined as an increase in conductance of at least .05 micromho, occurring independently of any known stimulus that had either leveled off or begun to decrease within 5 sec of onset. Spontaneous responses were discarded if they occurred within 5 sec of any breath twice as large as the average of the five preceding breaths. Heart rate, in beats per minute (bpm), was measured by counting total pulse beats within each recording period. Frontalis muscle tension was measured in millimeters of pen deflection of integrated EMG activity (Travis, Kondo, & Knott, 1976). The EMG output was integrated at 2-sec intervals, and the average pen deflection was determined for all of these intervals within each recording period. Increases lasting 2-sec or less were assumed to be due to movement artifact and were discarded. Respiration rate, in cycles per minute, was the number of inhalation peaks within each recording period. For any pre–posttreatment comparisons, change scores were computed by subtracting scores on the final minute of the postrelaxation quiet period from the scores on the final minute of adaptation for physiological variables and by subtracting post- from pretreatment scores for subjective variables.

Evidence for and Comparative Incidence of Relaxation-Induced Anxiety

Our essential purpose in this study was to document the occurrence of relaxation-induced anxiety. Our supporting evidence comes from three sources that in the following order demonstrate the phenomenon with increasing objectivity but descending clinical clarity:

1. *Clinically observed, intense anxiety.* One subject failed to complete the second session due to a prototypical reaction. During the 45-sec practice period prior to adaptation, she began crying and reported intense anxiety; she chose to terminate the study because of the reaction. During this practice period, four additional subjects about to receive focused-relaxation training spontaneously reported fractional symptoms of relaxation-induced anxiety, including anxiety due to closing the eyes (2), restlessness (1), headache (1), feeling "uptight" (1), and fear of losing control (1). After the experimenter provided reassurance, gentle encouragement, and a suggestion to try the procedure "as an experiment," these four chose to continue; two (Subjects 1 and 9) later reported increased tension during that first session, and two (Subjects 4 and 5) reported no tension during the actual relaxation. The above observations clearly demonstrate the clinical phenomenon of interest and also suggest that for two fifths of the subjects showing such intense reactions, therapist support may circumvent the problem and result in a successful session. A methodological problem created by the ethical/clinical issues inherent in this phenomenon is that the subsequent forms of empirical documentation of relaxation-induced anxiety, presented below, are conservative estimates of its occurrence.

2. *Phenomenological report of during-session tension.* Regardless of what behavioral or physiological reactions may occur, a report of experiencing an increase in tension during a relaxation session is perhaps our best, single subjective marker of relaxation-induced anxiety. Subjects were asked on the Final Questionnaire whether they became more tense at any time as a result of experiencing the two techniques (data on this scale was missing for one subject). On this question, 30.8% reported feeling increased tension during progressive relaxation and 53.8% reported increased tension during focused relaxation (a nonsignificant difference between techniques), with only one subject (No. 11) reporting tension during both techniques. We take the above outcome as evidence of milder but clear exemplars of relaxation-induced anxiety and suggest that its occurrence under one technique may be eliminated by use of the alternative procedures.

3. *Subjective anxiety scales and physiological activity.* Finally, we analyzed the anxiety ratings and physiological activity for evidence of increases due to treatment. At this level of evidence, operational definition of what constitutes a relaxation-induced anxiety reaction is more problematic for three reasons. First, as indicated above, initial anxiety reactions among five of the participants required some clinical intervention reducing the likely intensity of subsequent expressions of the phenomenon on standardized measures. Second, we have no clear basis for determining the absolute amount of increase on each measure that would constitute an anxiety response. Finally, the failure to show the customary reduction in measures found in relaxation studies may constitute evidence of a process inhibitory to relaxation and therefore of an inferred anxiety/avoidance response to relaxation. Within the context of these interpretive problems, we chose the following four methods for documenting the occurrence of the phenomenon on these measures: (a) statistical comparisons between those subjects reporting more tension during the session versus those reporting less tension on the pre–post-treatment change scores on each of the 10 dependent measures, (b) the number of measures on which each subject showed pre–post treatment increases of any amount, (c) the scores of the two subjects showing the greatest absolute amount of pre–posttreatment increase on each measure, and (d) the scores of those subjects showing the increase in more than one physiological measure during the relaxation session.

Table 1 presents individual change score data and means for subjects reporting on the Final Questionnaire increases versus decreases in tension during relaxation under progressive and focused relaxation on each of the 10 pre-posttreatment dependent measures. Z-scores on each dependent measure were calculated for each subject in each treatment condition and were summed to yield a composite z-score. Mann-Whitney U tests were then performed between subjects reporting tension during the session and those reporting no increased tension. For progressive relaxation, reported tension was significantly associated with poorer composite outcome, $z = 2.31$, $p < .05$; for focused relaxation, the difference was in the same direction but not significant, $z = 1.28$.

For progressive relaxation, 42.8% of the subjects increased from pre- to posttreatment on at least one measure compared to 100% in focused relaxation ($z = 3.39$, $p < .001$).[2] Percentages of subjects increasing on at least one subjective and one physiological measure were also appreciable but not significantly different between conditions: 35.7% for progressive relaxation and 57.1% for focused relaxation. Four subjects increased on four or more dependent measures in focused relaxation; no progressive-relaxation subject increased on more than three measures. No subject in progressive relaxation displayed increases in phasic skin conductance or heart rate, whereas in focused relaxation, increases occurred among 53.8% and 42.9%, respectively, a significant between-group difference on both measures by the difference of proportions test (Blalock, 1960). Similar to the typical results from anxiety studies, it appears from the above data that desynchronous changes in different response domains are characteristic of both relaxation effects in general and relaxation-induced anxiety in particular.

In examining the greatest increases among the Table 1 data, two subjects (Subject 1 and Subject 3), both of whom reported increased tension during focused relaxation, showed substantial increases on several measures. For Subject 1, these occurred primarily on subjective-anxiety measures, including a 37-point increase on the Anxiety Differential; for Subject 3, the increases were in four physiological measures, including an increase in spontaneous fluctuations of 9, in skin conductance level of 1.8 micromhos, and in heart rate 4.6 bpm. Both of these subjects reported no tension increase when receiving progressive re-

[2] For physiological variables, the following criteria were employed to operationally define an increase: (a) tonic skin conductance: increase of at least 1 micromho; (b) spontaneous skin conductance: increase of at least 1 spontaneous response per minute; (c) heart rate: increase of at least 1 beat per minute; (d) respiration rate: increase of at least 1 cycle per minute; (e) frontalis EMG; increase of at least 1 mm of pen deflection.

laxation and displayed decreases on nearly all measures during that procedure.

Finally, Figures 1 through 4 present examples of subjects who increased in more than one physiological measure during treatment. Four of the subjects (two in progressive and two in focused relaxation) reported increased tension during the session on the Final Questionnaire, whereas three subjects (two in focused and one in progressive relaxation) reported no increase in tension.

Comparison of Treatment Outcome

In addition to assessing incidence of relaxation-induced anxiety, we examined the comparative efficacy of the two techniques in reducing anxiety/physiological activity. No pretreatment differences between conditions emerged in Hotelling's T^2 on all variables combined or in any of the 10 univariate t tests. Multivariate analysis of variance on change scores for the 10 dependent variables revealed a significantly greater decrease in anxiety/physiological activity in the progressive relaxation condition, $F(10, 15) = 4.74$, $p < .01$. A significant Order × Treatment interaction was also observed, $F(10, 15) = 2.77$, $p < .05$, due to the tendency of focused relaxation to be less effective when presented second than when presented first. Univariate analyses of variance revealed that progressive relaxation produced significantly greater reductions than focused relaxation on the Anxiety Differential, $F(1, 24) = 5.18$, $p < .05$, heart rate, $F(1, 24) = 16.95$, $p < .001$, spontaneous skin conductance responses, $F(1, 24) = 11.16$, $p < .01$, and verbal posttreatment ratings of both mental tension, $F(1, 24) = 4.56$, $p < .05$, and bodily tension, $F(1, 24) = 4.63$, $p < .05$.

Table 1
Individual Change Scores and Means for Subjects Reporting Increases in Tension Versus No Increased Tension for Each Technique on Each Dependent Variable

Subject no. and tension report	AD	CSAQ COG	CSAQ SOM	VTR Body	VTR Mind	Phasic SC	Tonic SC	HR	RR	EMG
		Variable								
Focused relaxation										
Increased tension[a]										
1	+37	+21	+26	−4	+4	0	−.25	−3.7	−3.9	−4.2
3	+4	−4	+5	+1	−2	+9	+1.80	+4.6	−3.1	−8.2
9	0	0	−6	0	0	+1	−.14	+1.6	−2.9	−6.6
11	0	+2	−1	0	0	+2	+1.67	+.9	−.8	+.9
12	−10	−4	−7	0	0	0	−3.46	+6.3	−.5	−6.0
13	−2	−2	−9	0	−2	0	+.05	−4.8	−1.2	−5.7
14	−17	−4	−20	−2	−2	+3	+.35	−5.0	+3.9	−.4
M	+1.7	+1.3	−1.7	+.4	−.3	+2.1	0.0	0.0	−1.2	−1.9
No increased tension										
2	−10	−7	+1	−2	−3	+5	−1.92	+2.5	−1.8	+.3
4	−22	−19	−14	−2	−2	−2	−2.70	+3.0	−.6	−3.1
5	+6	−5	+10	0	−2	+5	−2.33	−3.8	−2.8	−11.7
6	−23	−4	−5	−1	−2	0	−.77	−2.0	−1.0	+1.8
8	−2	0	−2	−1	−1	+2	−.44	−.3	−1.2	+1.8
10	−3	−9	−22	0	0	+1	+1.32	+1.6	+1.1	+.1
M	−9.0	−7.3	−5.3	−1.0	−1.7	+1.8	−.5	+.2	−1.1	−1.8
Progressive relaxation										
Increased tension										
2	−17	−7	−14	−2	−2	0	+1.54	−6.9	−1.7	−.5
4	−5	−4	+4	−1	−1	−4	+1.86	−5.4	+2.4	−2.3
6	−6	+3	−1	0	−2	−1	+1.35	−2.6	−4.0	−2.7
11	−4	−3	0	0	−1	0	+.11	−3.6	−.6	+1.0
M	−8	−2.8	−2.8	−.8	−1.5	−1.3	+1.2	−4.6	−.9	−1.1
No increased tension										
1	−2	−3	0	0	−2	0	−.79	−8.0	−1.5	−1.3
3	−18	−12	−9	−4	−3	−1	−1.10	−6.5	−10.0	−2.6
5	−12	−5	+1	0	0	−3	+2.32	−7.8	−3.0	−10.7
8	−18	−17	−21	−1	−1	0	−1.85	−4.7	+.1	+.1
9	−26	−7	−16	−2	−3	−1	−.33	−1.2	−7.2	−13.3
10	−13	−4	−3	0	0	−2	−5.10	−5.4	−.2	−10.0
12	−25	−4	+7	−2	−5	0	+.19	−.8	−.3	−.4
13	−8	−12	−14	−1	−5	0	+.31	−4.5	−2.7	−3.6
14	−14	−24	−16	−2	−1	−1	−.27	−7.8	−1.9	+1.1
M	−15.1	−9.7	−7.9	−1.3	−2.2	−.9	−.7	−5.1	−2.9	−4.5

Note. AD = Anxiety Differential; CSAQ (COG & SOM) = Cognitive-Somatic Anxiety Questionnaire, Cognitive and Somatic subscales; VTR = Verbal Tension Rating; SC = skin conductance; HR = heart rate; RR = respiration rate; EMG = electromyograph.
[a] Underlined values indicate the two greatest increases on each measure.

Correlates of Treatment Outcome

Pretreatment personality measures and posttreatment subjective measures were correlated with composite change scores to examine specific mechanisms for the phenomenon. Composite scores were constructed by first normalizing change scores for each dependent variable separately and then summing the 10 normalized scores. In all correlations using these scores, positive correlations indicate that high scores on a given variable correspond to poor outcome. One-tailed significant levels are reported, since our

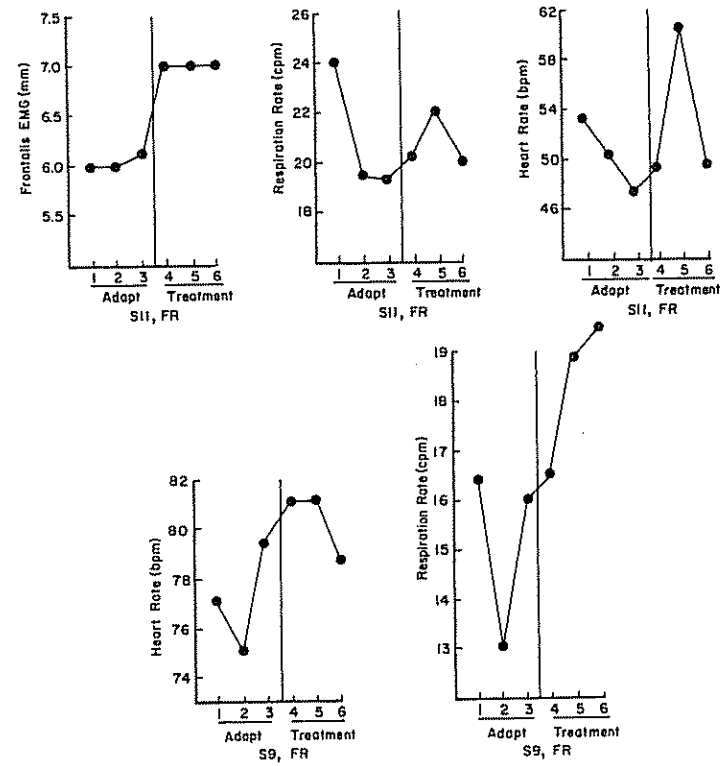

Figure 1. Physiological data on subjects (S) who displayed during-treatment increases on more than one measure and who indicated tension during focused relaxation (FR). (EMG = electromyograph; cpm = cycles per minute)

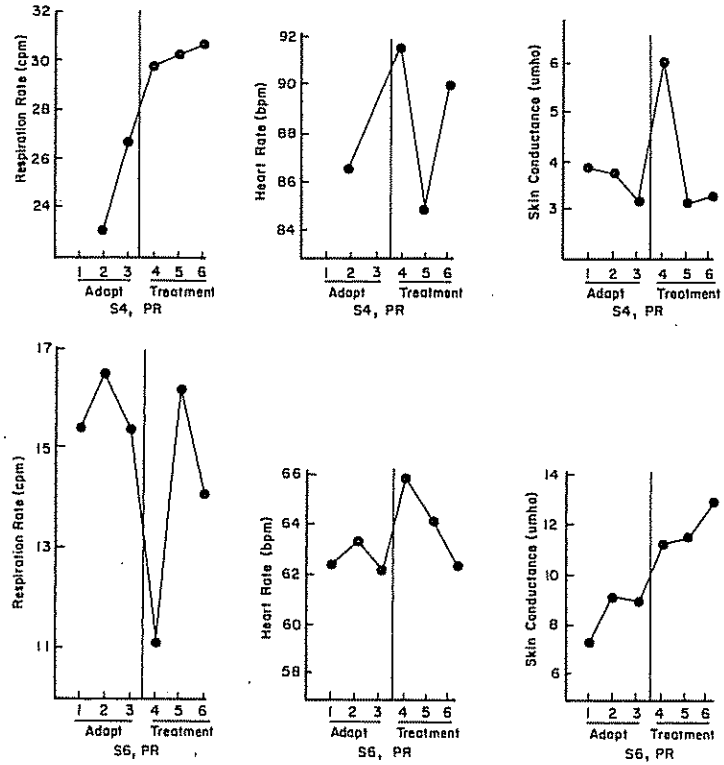

Figure 2. Physiological data on subjects (S) who displayed during-treatment increases on more than one measure and who indicated tension during progressive relaxation (PR). (cpm = cycles per minute; bpm = beats per minute; umho = micromho)

hypotheses were directional. Correlates described were significant at least at the .05 level.

Correlations of composite change scores with pretreatment personality measures and posttreatment sensory-alteration items are presented in Table 2; no relationships emerged with the cognitive-affective items on the post-questionnaire and thus these are not included. A substantially larger number of significant correlates emerged for progressive relaxation than would be expected by chance. Nevertheless, these results must be considered very preliminary, due to the large number of correlations calculated on such a small number of subjects. For this technique, poor outcome was significantly associated with openness to absorbing and self-altering experiences (Absorption scale), belief in the efficacy of effortful or controlling strategies (Effort/Control Scale-Mechanism b), and general restlessness/fear of inactivity (Factor 3). Intense experience of visual, auditory, and kinesthetic alterations during relaxation was also significantly associated with poor outcome (Mechanism a). None of the personality measures correlated significantly with change scores for focused relaxation; however, poor outcome was associated with feeling pain during relaxation. It is surprising that olfactory alterations ("smelling" scents) were associated with good outcome for this technique, a result that might be attributable to scents given off by fresh flowers in the experimental room.

Outcome for both techniques failed to correlate significantly with most cognitive-affective items hypothesized in the literature to cause deterioration effects, including hostile, sexual, and disturbing thoughts or images.

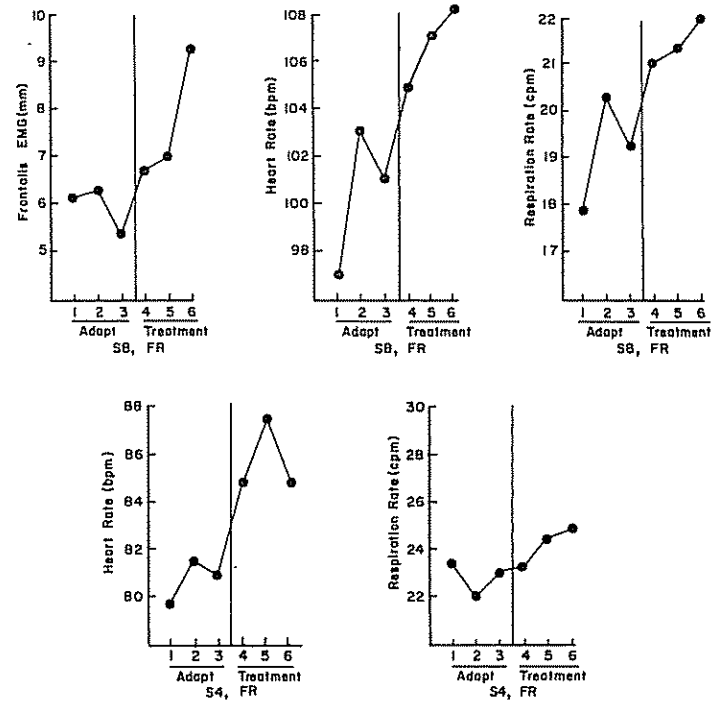

Figure 3. Physiological data on subjects (S) who displayed during-treatment increases on more than one measure and who indicated no tension during focused relaxation (FR). (bpm = beats per minute; cpm = cycles per minute)

For focused relaxation, however, feeling out of control (Mechanism b) was significantly associated with poor outcome, $r = .56$, $p < .03$. Using t tests, no significant differences were obtained between treatments in the intensity of stress-release effects experienced during relaxation.

Discussion

Evidence of relaxation-induced anxiety was found primarily in the clinical observation of intense anxiety reactions among five subjects during the preliminary practice period and in the report of increased tension due to the training among a sizeable percentage of subjects in both relaxation conditions. Pre–posttreatment rating scales and physiological measures generally displayed reductions due to treatment, despite the fact that many subjects reported increased tension during the sessions. Subjects reporting tension during the session did show smaller reductions on those measures than subjects reporting no increased tension, significantly so in the case of progressive relaxation. However, with two notable exceptions, the size of

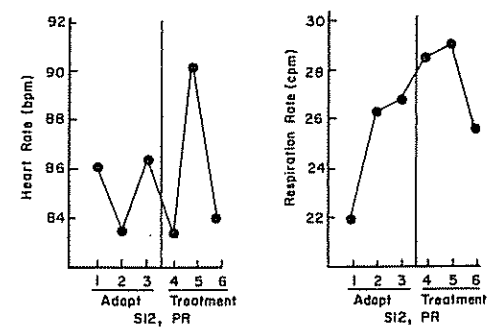

Figure 4. Physiological data on subjects (S) who displayed during-treatment increases on more than one measure and who indicated no tension during progressive relaxation (PR).

pre–posttreatment increases on the 10 subjective and physiological outcome measures was not substantial. Two subjects showed increases across most measures of the same response domain, one in subjective anxiety measures and the other in physiological measures. Consequently the rating scale and physiological outcomes document more clearly the occurrence of desynchronous changes during relaxation, similar to the desynchrony found in other anxiety research (Hodgson & Rachman, 1974; Lang, 1968), than they show the occurrence of relaxation-induced anxiety. Similarly although some of the greatest increases in physiological activity during treatment occurred among four subjects reporting increased tension during the session, not every subject experiencing subjective anxiety showed such increases. Three subjects reported no tension, despite increases in more than one physiological channel during treatment. Thus, the occurrence of tension or anxiety due to relaxation may be based on different experiences for different subjects.

Although we captured the relaxation-induced anxiety phenomenon to some degree, the absence of clear evidence from the subjective ratings and physiological measures suggests that the event may be difficult to study. If it occurs in prototypic fashion, ethical issues restrict its continued, objective observation or require a weakening of the phenomenon, making its objective measurement more conservative. We thus have two choices in this area. One is to continue to investigate the phenomenon in its weaker form, as was done here, and hope that conclusions drawn from such studies will generalize to the prototypic event. The other is

Table 2
Correlation of Personality Measures and Sensory-Alteration Items With Composite Change Scores for Each Relaxation Condition

Variable	Progressive relaxation	Focused relaxation
Personality measures—prequestionnaires		
Trait Anxiety	.04	−.35
CSAQ-Trait Cognitive Anxiety	.26	.07
CSAQ-Trait Somatic Anxiety	−.46*	−.16
Locus of Control[a]	.07	−.07
Absorption Scale	.64**	−.38
Effort/Control Scale	.65**	−.33
Cognitive Discrepancy Scale	.02	−.26
Factor 1—RRAQ	.25	.02
Factor 2—RRAQ	.05	−.23
Factor 3—RRAQ	.66**	.10
Factor 4—RRAQ	.22	.34
Sensory-Alteration Items—Postquestionnaire		
Tingling	−.10	.38
Floating	.47*	−.22
Heaviness	−.07	.44
Numbness	.13	−.05
Size distortion[b]	—[c]	−.04
Pain	.25	.52*
"Seeing" images	.47*	−.17
"Hearing" sounds	.49*	.12
"Smelling" scents	—[c]	−.46*
Feeling tilted	.49*	.14
Intensity index	.69**	.11

Note. N = 14 for all measures except where noted. CSAQ = Cognitive-Somatic Anxiety Questionnaire; RRAQ = Reactions to Relaxation and Arousal Questionnaire.
[a] N = 12 for both conditions.
[b] N = 13 for focused relaxation.
[c] No subject reported experiencing these items for progressive relaxation.
* $p < .05$. ** $p < .01$.

to conduct intensive clinical case studies, wherein the event can be objectively documented in the context of therapeutic support and encouragement to the client to confront the feared situation.

The anxiety phenomenon in this study may have been induced partially by the laboratory setting, the presence of physiological monitoring, or other experimental factors. However, the occurrence of anxiety manifestations was limited solely to the actual experience of relaxation periods (either practice or structured training) and not during other portions of the session. At best, then, the extratherapeutic circumstances may have sensitized subjects to relaxation-induced anxiety but did not in themselves produce its occurrence.

Although no differential prediction was made concerning the two relaxation techniques, the results suggested a higher incidence of relaxation-induced anxiety and significantly inferior relaxation effects with focused relaxation. Apparently, focused cognitive attention is more anxiety provoking and/or less facilitative of relaxation than focused somatic attention, perhaps due to therapist verbalizations of relaxation patter and the greater degree of structure inherent in progressive relaxation. If replicated, these results might provide a case for training tense clients in progressive relaxation rather than mantra meditation, at least in initial sessions. Alternately, however, it might be argued that clients who fear loss of control or who tend to overexert themselves might be better served in the long run by a technique that forces them to confront these issues. Although less helpful in facilitating immediate tension reduction, meditation might be more therapeutic as a means of learning how to surrender control or to employ less effort, given its emphasis on passive processes. It would be of interest to investigate whether repeated exposure to either technique leads to anxiety extinction, as would be hypothesized from a strictly behavioral view.

Of the five mechanisms proposed to mediate the phenomenon, previous theoretical speculations about causes of relaxation-induced anxiety have placed heavy emphasis on the side effects released through a process of "unstressing" or stress-release (e.g., Budzynski et al., 1980; Carrington, 1977; Glueck & Stroebel, 1975) and on fears of losing control or exerting undue effort to achieve control (Bernstein & Borkovec, 1973; Carrington, 1977). Within the restraints of the present data discussed earlier, both of these proposed mechanisms received some support. For progressive relaxation, sensory side effects of relaxation were strongly associated with poor outcome. For both techniques, poor outcome was significantly associated with measures of fear of losing control. Since no relationship emerged between outcome and Rotter's (1966) Locus of Control scale, inhibition of relaxation and/or anxiety enhancement during relaxation appears to be related not to beliefs about whether reinforcers are controlled in general by self or by the environment but rather to concerns about whether the control one already has will be eliminated. Little support was found for the other mechanisms. Due to the use of a large number of variables and a small number of subjects, the above relationships must be viewed with caution and await replication before meaningful conclusions can be drawn. Moreover, whether they relate to relaxation-induced anxiety or simply to general relaxation effects remains to be answered.

The construct of relaxation-induced anxiety has both practical and theoretical importance. Clinically its occurrence may prevent the useful application of relaxation to the treatment of general anxiety/tension, and the identification of alternative techniques to circumvent the problem may be of value. Theoretically, the notion that a relaxed state may be discomforting implies that general anxiety may be maintained, in the absence of environmental stressors, by motivated high arousal. If this were true, the client may allow constant, moderate tension to occur in avoidance of the more intense anxiety generated either cognitively or somatically in the relaxed state.

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